The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XLIX
No. 1268

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Safety First

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON — Telephone: CENTRAL 3212 (10 lines)

GLASGOW: 116, Hope Street (Central 3970) — BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5

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Coming Events . . .

THE further development of the chemical industry is clearly of the highest importance to the national well-being. The war of 1914-18 disclosed that fact and it took us some years to make up the deficiencies that had arisen as a result of the lack of official foresight. It is perhaps too much to expect that Governments, composed as they are of amateurs who possess a peculiar facility for making grandiloquent speeches that contain the least possible amount of new matter in the greatest possible number of purple passages, should be able to take a long and sound view of technical progress. When by some fortunate chance a Government has assisted an industry which later turns out to be of vital importance, great is the self-congratulation. These things are well known, and although they may provide material for ribald commentary, they carry with them consequences of some moment. One of these is the opinion that industry itself must lead the Government, and not vice versa. Unfortunately, there are vested interests primarily among the employees, interests crystallised in the Trades Unions and the Labour Party, that too often act, for party or sectional purposes, counter to the leaders of industry. The Government, which exists to give expression to public opinion, is thus in some doubt as to which voice to listen to. It is here that the technical man should be heard, and it is here that his advice is most valuable. He is pre-eminently concerned with technical progress and by his special knowledge he can foresee trends in industry and the probable repercussion of those trends on the well-being of the country, to a degree which demands that his view should command attention.

The development of the organic chemical industry is a subject on which we have had a good deal to say in these columns in recent months. We have noted that huge amounts are being spent in other countries on research, and that American oil interests are developing a great organic chemical industry based on the permanent gases and low-boiling fractions derived from the several operations of the industry. We have noted that there is very little refining in this country and that with the coming of lease-lend, certain projects "of great pitch and moment" were turned awry, so that the prospects of petroleum refining in this country now seem pretty thin; and the

On Other Pages

N_2O by Neil Nettleton

Don't keep on telling us the wallpaper gives height to the room.

British chemical industry will be debarred from participating in the chemical developments that will arise from the availability of the resulting hydrocarbon by-products. It has for some time appeared to us that we must accept this position with a good grace.

We have also to bear in mind that each nation must for the future make the best possible use of its own raw materials. Great Britain has a little natural gas but no petroleum. We have, however, been specially favoured by Nature with ample supplies of coal of the most varied kinds. Accordingly, we have urged in these columns from time to time, and with some persistence, that we should set about treating coal as the raw material for chemical manufacture, in addition to its utilisation as a feul. Colonel Bristow, as was explained in our issue of May 8, has shown how organic chemicals can be made from the unsaturated bodies in the tar and gas derived from low temperature carbonisation. The Germans and I.C.I., aided by the Fuel Research Board, have shown how oils can be produced from the hydrogenation of coal. The Germans again have shown how oils and unsaturated hydrocarbons can be made by the Fischer-Tropsch process. It is believed that there have been considerable developments in this process since the war; but in this country we have no large-scale plant. The development of the Lurgi process of hydrogenation-during-carbonisation by the Gas Research Board will also be fresh in memory. There are evidently a number of ways known already by which coal can be converted into low-boiling liquids and permanent gases that might well serve as the starting point for numerous other chemicals of commercial value.

We are pleased to think that the happy consummation of our efforts is to be found in the announcement published in these columns on September 18, when

it was stated officially that the colliery owners of this country, aided no doubt by the D.S.I.R., are to provide some £500,000 (in addition to their original research fund of £1,000,000) for "the further extension of the industry's coal research activities . . . into the development of processes for producing hydrocarbons and hydrocarbon derivatives from coal, and in the treatment of coal generally as a chemical raw material." There is, of course, a long time-gap between research and commercial processes, but, as we know from experience, research soon leads to commercial development when the way is partly explored already. The work is to start immediately, and the chemical industry will do well to keep a watchful eye upon what is being done. It may well be that the major process for producing chemical intermediates from coal will be operated by the collieries, just as the coke-oven process is operated by them. But at the least the chemical industry will find employment in working up these intermediates into commercial products.

NOTES AND COMMENTS

Laboratory Ware

THREE weeks ago we published a letter from Mr. Norman Sheldon, chairman of the British Chemical Ware Manufacturers' Association, in which he dealt with the future of the scientific instrument and laboratory equipment industry. As some of our readers may know, Mr. Sheldon has been giving much time latterly to the consideration of the problems which he outlined in that letter. We are glad to hear that a meeting has now been held at which representatives of six trade associations concerned in this industry discussed proposals put forward by Mr. Sheldon in support of his policy. They declared their determination to take steps to ensure that Britain shall lead the world in the production of every type of instrument and material used in the prosecution of research and process control. They expressed the view that the maintenance and future development of Britain's economic system is so dependent on scientific progress that their industry must join forces with the various scientific societies in preparing a plan for post-war development.

Makers and Users to Combine

IT was proposed that problems which normally keep the manufacturer and the consumers in separate camps should be discussed openly at joint meetings, in order that advice may be tendered to the Government as to the best way of ensuring that these industries shall be encouraged and maintained in the highest possible state of activity and efficiency in the interests of the nation and the Empire. The decision was taken that these industries should be given a distinctive title so that their unique position in the industrial system may be made clear. A committee is being formed to carry on the work which Mr. Sheldon has been doing to gain public support for his proposals by educating popular opinion in these matters.

Factory Accidents, 1942

THERE is no industry that cannot derive some advantage from a study of the annual report of the Chief Inspector of Factories (published last week), and we state without hesitation that any industrialist who neglects to peruse it is guilty of a dereliction of duty. Apart from its essential usefulness, Sir Wilfrid Garrett's report is a document of the highest interest, both human and industrial. Some of its sections which pertain specially to the chemical industries are considered on a later page of this issue, but there are certain wider aspects on which comment here may not be altogether without value. The growth of public opinion in the direction of insisting on improvement in the general well-being of the factory worker was so marked during the year under consideration that it was listed especially as one of the main features of the period; and this, together with the numerous and complex new processes that have come into being, necessitated a vast extension of the work of the Factory Inspectorate. Despite all their labours, the year 1942 saw a considerable increase in the total number of reportable accidents, though

the percentage increase—16 per cent.—was lower than in the two preceding years. It is enormously to the credit of the Department that a decrease of 283 was recorded in the number of fatal accidents, which fell from 1646 to 1363. This is a fair index of the care being exercised against the serious accident risks.

Working Conditions Improved

FACTORS causing the increase in the total number of accidents can be briefly summarised as follows: (1) Increased employment of women and girls, especially on relatively dangerous machines; (2) Rapid acceleration of production combined with increased weariness due to long hours; (3) Increased demands on overworked supervisory staff, and loss of maintenance staff; (4) Desire to speed-up the job at all costs; (5) Employment of older men on a full share in the war effort. Concerning factor (1), it is interesting to note that the number of reportable accidents to adult females was 389 per cent. higher than in 1938, whereas with adult males the percentage rise was only 51. Sickness, incipient or otherwise, has been a further factor in the increased accident rate: and, to ameliorate this, excellent work has been done by consultation with workers as to the best conditions. Heating and ventilation problems have been studied, and much improvement effected without interference with the principles of fuel economy. The 100 per cent. black-out which was the ideal of factory designers earlier in the war has been modified with a view to better atmospheric conditions; and numerous excellent new lighting installations have been reported, despite supply difficulties, including many instances of the use of fluorescent tubular lighting.

A Hopeful Sign

THE older inspectors have been much heartened in their work by the better use, on the part of the workers, of the amenities they have striven so long to provide. It may well be that the admixture of men and women, and of persons in different grades of society in one and the same factory has been partly responsible for this. "One of the most hopeful signs of the year," Sir Wilfrid concludes "is the manner in which we are all keeping our tempers under those irritations of war that come to all of us. . . . Part of this pulling together is undoubtedly due to the development of joint committees of various kinds in factory life."

Fashions in Safety

CLOTHING worn around machinery should be close-fitting without flowing ends; sleeves should be rolled up; flapping ties or ribbons prohibited, long hair protected by caps or nets (this applies to the masculine "quiff" as well as to the female mane); caps with celluloid vizors prohibited. Gloves are generally a hazard when operating machinery, but an asset in handling rough materials. The Royal Society for the Prevention of Accidents has tackled the problem of women workers' clothes from a new angle—that of Fashion. Their latest booklet, *Tops and Toes*, produced for the Factory Department, deals with two awkward problems, the proper wearing of caps and the wearing of proper shoes. Cap patterns are included to interest the feminine reader; and there are some pointers from experts on the care of the hair and hands, and on the ill-health that may be caused by unsuitable footwear. Mass distribution among female employees is recommended.

Who are Chemists ?

"BUT we may well ask, Who are chemists?" said Dr. Lampitt, in his S.C.I. medallist's address. The snag is that even if scientific circles in Britain were to give an accurate definition of the term "chemist," it would still mean very little to people outside the profession, for the man-in-the-street reserves the term to describe the man behind the counter in the *chemist's* shop. We are very interested, therefore, to learn that, as a result of representations made by the Canadian Institute of Chemistry, the word "chemist" has been replaced by "pharmaceutical chemist" throughout the new Pharmacy Act of Ontario. The fact that this welcome change of nomenclature has been made is a recognition that industrial chemists, in Ontario at least, have the legal right to call themselves "chemists." The Canadian Institute intends to use its success in Ontario as a lever in order to induce other provinces to follow suit.

Electrolytic Chlorine

Modern Production Plant

by D. D. HOWAT, B.Sc., Ph.D., F.I.C., A.M.I.Chem.E.

COMMON salt has always been the raw material for chlorine production. Until the beginning of the present century practically the entire demand was obtained from salt by purely chemical processes: in the early stages by the action of sulphuric acid and manganese dioxide on salt, and later by the oxidation of hydrochloric acid procured from salt.

The evolution of chlorine on the passage of an electric current through a solution of salt was first noted in 1800, but development was slow and only towards the end of the 19th century did the electrolytic chlorine industry begin to make headway. As roughly equal quantities of chlorine and caustic soda are produced during the electrolysis of brine, the extension of the electrolytic chlorine industry had tremendous repercussions on the alkali manufacturers. By this time the ammonia soda process for the manufacture of caustic soda and soda ash had reached a high level of efficiency, but had now to meet the challenge of a new competitor, in the alkali produced in the electrolytic chlorine plants. The expansion of the newsprint industry created a good market for chlorine and many of the paper and textile plants installed electrolytic cells for the production of chlorine, marketing the surplus alkali as quickly and cheaply as possible. To meet the threats of the electrolytic products the ammonia soda companies replaced some of their existing low-pressure steam plant by building high-pressure steam generating equipment, and used the steam first in turbines driving generators, the exhaust from the turbines meeting the ordinary low-pressure process steam demands. The electric power generated in this manner was employed for the production of electrolytic chlorine and alkali.

A very marked expansion occurred in the alkali industry. Taking the U.S.A. statistics as an example, the total production of alkali rose from a quarter of a million tons in 1921 to over four times that amount in 1939. During this same period the alkali produced from ammonia soda plants increased from 163,000 to 523,907 tons, but the expansion of electrolytic alkali showed much more striking figures, advancing from 75,000 to just on the half million mark.

The phenomenal development of the rayon or artificial silk industry has played a critical part in the expansion of the alkali industry. As the estimated consumption of caustic soda by the rayon industry is somewhere near a quarter of the total amount produced, the dominating influence of this market may be realised. Of caustic soda for the rayon industry the most important feature is high purity, a demand which has necessitated much intensive research and modification of processes in the alkali industry. In the electrolytic cells described later, although chlorine is regarded as the primary product, the design and operation of the cells are frequently determined by the market requirements in the caustic alkali which is the secondary product. The process comprises a number of stages: purification of the brine; heating the brine to the correct temperature; electrolysis; and the collection and purification of the chlorine and alkali.

Purification Control

The heavy metal impurities in the crude brine solutions are precipitated as carbonates by the addition of soda ash. In certain types of cell the brine is recirculated through the cells and the accumulation of certain impurities, particularly sulphates, is a serious difficulty. The purification process must be carefully controlled and a regular discard of solution made to avoid the building up of impurities. Low-pressure steam heaters control the temperature.

The consumption of electric power in the cells may be taken approximately as 3000 kWh per ton of chlorine produced, while to this figure must be added 400 kWh for auxiliary power expended in pumping, compressing, lighting and handling. From 0.70 to 0.90 lb. of caustic soda are also produced per kWh expended in the cells. The total current

load depends upon the type of cell employed, the actual figure varying from 1200 to 20,000. Some average figures covering certain of the types of cell described are given in Table I.

The handling of the chlorine gas produced from the electrolytic cells presents a number of problems. The gas is first cooled to 12/14° C. to prevent the formation of solid chlorine hydrate which would give rise to plugging of the pipe lines. Stoneware pipe lines, submerged under water, stoneware disc coolers, water-cooled glass pipes or rubber-lined steel pipes are all employed to maintain the chlorine at the desired temperature. After drying with concentrated sulphuric acid the gas passes to the condensers, refrigerating machines, and compressors. The liquefied gas is transported in cylinders or, in the most modern plant, in 30-ton tank cars.

Purification of the caustic alkali solution has been the most tricky and difficult of many problems, particularly where the rayon industry market was aimed at. From one of the most common groups of cells—the diaphragm type—the cathode product is a solution of 90/120 gm. of sodium hydroxide and 130/160 gm. of salt per litre. Modern technique consists in a series of fractional crystallisations of the caustic soda as the heptahydrate. A dialysis process has also been perfected to eliminate the last traces of the salt from the causic soda after crystallisation and evaporation.

The production of stick caustic soda is not so common as formerly; aqueous solutions of 50 or 70 per cent. strength are transported to the consuming centres in 30-ton insulated and protected cars. To avoid contamination of high purity material nickel equipment is being employed.

Quantities of hydrogen are evolved as a by-product during the electrolysis. In some cases this is allowed to go to waste, but attempts are being made to utilise it in various ways, *e.g.*, in the production of hydrochloric acid, for hydrogenation of oils, or for direct sale in cylinders.

The basic reactions in the electrolysis of a brine solution are fundamentally simple. Chlorine is evolved at the anode and sodium migrates to the cathode. The electric charge on the sodium ion is neutralised with the formation of alkali and the liberation of hydrogen. To ensure a successful commercial application of the process the reaction products must be kept separate and removed as rapidly as possible from the cell. If the products of electrolysis are not kept

TABLE I.—OPERATING CHARACTERISTICS OF SOME CHLORINE CELLS (MANTELL)

	Sorensen	Krebs Mercury	Hooker "S"	Hargreaves-Bird	Krebs Diaphragm	Wheeler
Shape of cell	Rectangular	Rectangular	Square	Rectangular	Rectangular	Cylindrical
Voltage across cell	4.2	3.85—4.0	3.28—3.45	4.2	3.3—3.7	3.6
Current per cell, amps.	1300	3250—15,000	5000—7000	3000	500—6000	1200—1600
Current density, anode, amp./sq. in.	0.8	1.03—1.61	0.318—.446	0.03	0.4	0.14
Current density, cathode, amp./sq. in.	0.8	0.97—1.61	0.268—.377	0.21	0.39	0.37
Current efficiency of cell %	90—95	94—96	94—95.5	90.0	93—94	96—99
Energy efficiency of cell %	48—52	50—60	64—66	50.0	58—66	60—62
Lb. NaOH per kWh.	0.70	0.68—0.75	0.910—.940	0.914 Na_2CO_3	.84—.95	0.83
Lb. chlorine per kWh.	0.63	0.60—0.67	0.840	0.62	.75—.83	0.74
Anode material	Graphite	Graphite	Graphite	Graphite	Graphite	Graphite
Cathode material	Mercury	Mercury	Steel Wire Screen	Perforated Steel	Iron	Woven Wire
Diaphragm material	—	—	Deposited Asbestos	Composition	Asbestos	Asbestos paper
Cell-container material	Concrete	Steel/Ebonite	Concrete	Steel/Ceramic	Steel/Concrete	Quartz/Cement
Anode life, days	600	—	350—600	750	—	480—600
Avg. operating period of cell, days	28	—	100—300	360	270—300	150—200
Raw material	Brine	Brine	Brine	Brine	Brine	Brine
Concentration of cathode alkali, gm./litre	50%	350—600	135	170 Na_2CO_3	110—130	110—120
Salt concentration, cathode alkali, gm./litre	Trace	Trace	14—15%	—	130—170	140—170
External measurements of cell	5′×6′×1′	—	4½′×5′×3′ 8″	11½′×7′×1½′	—	29″×36″
Size of anode	9(20″×9″×2″)	1½″×6″×18″	90 anodes	12(16½″×9″×2″)	—	28(2″×2″×32″)
Size of cathode	—	—	Active surface 129 sq. ft.	10′×5′	—	34″×80″

separate, hypochlorites and chlorates form, with the development of acidity in the cell and eventually the liberation of oxygen. Two methods of separating the products of electrolysis are practised. The first and simpler method is the use of a diaphragm, commonly an asbestos covering on an iron screen cathode. To minimise attack by chlorine, the anode is made of graphite and the collecting chamber on top of the cell is concrete impregnated with asphalt, or rubber-covered steel, or ebonite. The chief objection to this type of cell is the low caustic and high salt content of the cathode solution, so that a further elaborate process of separation is required. The other and more complicated arrangement involves the employment of a mercury cathode. The low over-voltage of sodium on mercury causes the sodium ions to be discharged on the mercury and to alloy with it to form an amalgam. The amalgam is decomposed in a second section of the cell (the denuder section), with the formation of pure alkali and the liberation of hydrogen. The supremely important feature of the mercury cell is the production of alkali of a purity suitable for use in the rayon industry although in all other respects it has an inferior performance to the diaphragm cell. In comparing the two types of cells the following points may be noted.

Mercury Cells : Advantages

1. *High grade caustic is produced.* The solution contains up to 50 per cent. caustic and in many cases is shipped directly without further treatment. Even if 70 per cent. solution or stick caustic is required, evaporation costs are considerably reduced as compared with diaphragm cells.

2. *Caustic solution produced is practically free of salt.* For this reason the caustic solution from mercury cells finds a very ready market in the viscose rayon industry.

3. *Mercury losses are small during operation.* Annual replacement of mercury to cover all losses is less than 2 per cent.

Mercury Cells : Disadvantages

1. *Initial cost is high.* Large quantities of mercury are initially required.

2. *Mechanical means are necessary for circulation of the mercury.* Paddle wheels, pumps, or screw elevators are all employed, with attendant wear-and-tear and maintenance charges.

3. *Elaborate cell design is required.* The cells are built in two parts, the electrolytic section and the denuder section. This design, together with the incorporation of the necessary means for circulating the mercury, renders the construction expensive and complicated.

4. *Large floor space is occupied.* In comparison with the diaphragm cells the plan area of the mercury cells is great.

5. *Greater potential drop across the cells is involved.* Owing to the method of construction and the use of circulating mercury, the potential drop across the cells is greater than that in the diaphragm cells, although final current efficiencies are about equal.

6. *Risk of explosion.* If operating conditions are not rigidly controlled, hydrogen may be formed with the chlorine, giving a dangerously explosive gaseous mixture.

Diaphragm Cells : Advantages

1. *Larger capacity per cell is possible.* The compact arrangement of anodes and cathodes permits a greater throughput of brine solution and consequent production of chlorine and caustic.

2. *No mechanical or moving parts are required.* Maintenance and repair costs are therefore low.

3. *Smaller floor space is occupied.* Cells are normally cylindrical or square in section and may be spaced in a comparatively closely packed arrangement.

4. *Initial costs are lower.* The elimination of mercury and of any necessity for circulating the metal reduces initial costs of the cells.

5. *Power consumption is lower.* The close-packed arrangement of the electrodes enables the cells to be operated at a lower voltage.

Diaphragm Cells : Disadvantages

1. *Solution from the cathode compartment contains only a low percentage of caustic.* The alkali content of the cathode solution varies from 90 to 130 gm. per litre. In consequence considerable evaporation is necessary to increase the caustic content to a value sufficient for sale.

2. *Solution from the cathode compartment contains appreciable quantities of*

salt. Even after careful purification by fractional crystallisation, involving additional plant and operating expense, the caustic still contains sufficient traces of salt to make questionable its use in the viscose rayon industry.

3. *Purification of the cathode brine is required.* The brine recovered from the cathode solution is recirculated through the cell, successive cycles leading to accumulation of undesirable impurities (particularly sulphates) which have a deleterious effect on the process. A more highly developed purification treatment is rendered necessary than with mercury cells.

4. *The nature of the diaphragm.* The porous diaphragm, no matter what method of formation is employed, is a fragile component, with certain inevitable troubles, *viz.*:

(a) The throughput of brine depends largely on the state of the diaphragm, being high when the diaphragm is new and falling off with age.

(b) The voltage drop across the cell is dependent to a large extent on the state of the diaphragm, the value rising as the porosity decreases.

(c) The necessity for periodic renewal of the diaphragm involves the complete stripping down of the cell.

(d) The decreasing permeability of the diaphragm with age causes osmosis and subsequent contamination of the anode compartment by the cathode products.

(e) The difficulty of maintaining a satisfactory bond between the diaphragm material and cathode surface.

Types of Mercury Cell

In the typical mercury cell separation of the anode and cathode solution is effected by dividing the cell into two sections, liquid mercury forming the electric connection between the sections. The first, or decomposer, section carries the graphite anodes and incorporates an outlet for the liberated chlorine. Saturated brine, circulated through the section, is electrolysed, chlorine being forced out in the anode and escaping in gaseous form through the outlet, while the sodium ions alloy with the mercury, forming an amalgam. Flowing down from the first section, the mercury enters the second, or denuder, section where the amalgam is decomposed with the formation of alkali and the liberation of hydrogen.

Commonly the mercury forms a horizontal layer flowing by gravity along the slightly inclined bases of the two sections. In the decomposer section the saturated brine flows in the same direction as the mercury, the spent brine being resaturated and returned to the cell, while the mercury passes to the denuder section. A constant strength of caustic alkali is maintained in the denuder section by adjusting the delivery of distilled water at one end with the outflow of caustic at the other. The mercury flows into a compartment at the end of the denuder section from which it is lifted by mechanical means to be recirculated through the decomposer section. Current efficiencies are about the same as those in the diaphragm cells at 94/96 per cent., while energy efficiencies are 50/60 per cent. Graphite anode consumption is 6/7 lb. per ton of chlorine produced. Mercury losses are small at 0.15/0.25 lb. per ton of caustic produced. The voltage drop across the cell varies from 3.85 to 4.3 volts.

The salient points in a number of the commercial types of mercury cells may be mentioned briefly:

The Sorensen Cell

This cell, used extensively by one of the large paper companies in the U.S.A., incorporates some interesting features according to most recent patent literature (U.S.PP. 2,104,677: 2,104,678: 2,104,679: 2,226,784). The plan and section views (Figs. 1, 2, 3, 4) indicate that the decomposing section is divided into three adjacent channels by two longitudinal ribs. The channels are arranged in a series of steps, the mercury entering at the top, passing along the highest channel, and dropping from one to the other at the ends. As the mercury follows this tortuous path through the decomposer section it is kept continuously in contact with the negative pole of the electric supply by flowing over steel bars embedded in the concrete base. The anodes comprise nine graphite plates in three rows of three arranged just above the surface of the mercury, the chlorine

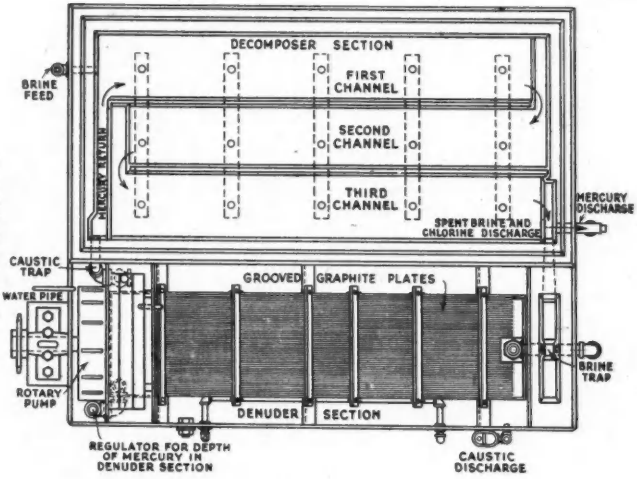

Fig. 1.—Sorensen Mercury Electrolytic Cell — plan view with the cover and anode assembly of the decomposer section removed (U.S.P. 2,226,784).

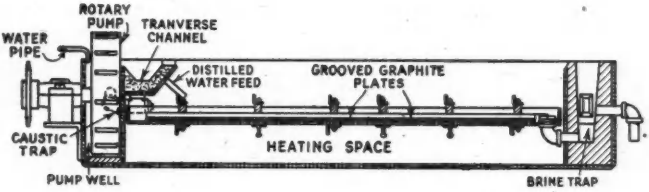

Fig. 2.—Sorensen Cell — longitudinal section through the centre of denuder section.

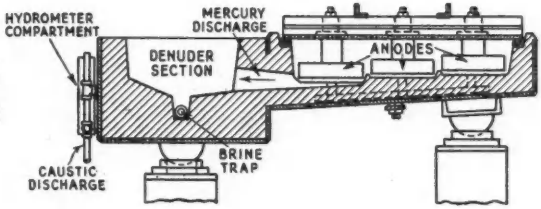

Fig. 3.—Sorensen Cell — transverse section through both decomposer and denuder sections (right side of Fig. 1).

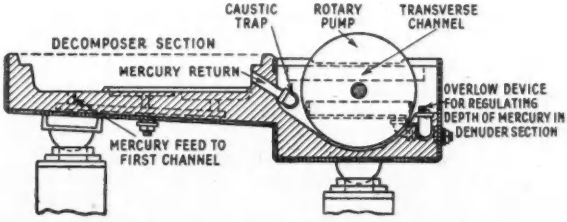

Fig. 4.—Sorensen Cell—as Fig. 3, but through left side of Fig. 1.

THE SORENSEN MERCURY ELECTROLYTIC CELL

generated being withdrawn through a pipe in the cell wall. Brine is fed to the cell through a pipe near the mercury feed point, and, flowing through the decomposer chamber, is discharged at the other end.

From the lowest point of the decomposer section the mercury, now carrying appreciable quantities of sodium amalgam, flows through a seal to the denuder or oxidising section. In the latest design the denuder section is composed of grooved graphite plates embedded in a pan below which is a space with means for heating the sodium hydroxide solution. The mercury passing over the grooved graphite plates comes into contact with distilled water which decomposes the amalgam, forming sodium hydroxide and liberating hydrogen. From the grooved graphite plates the mercury flows through a second seal, to prevent discharge of caustic soda solution, into the pump well, from which it is lifted by a rotary pump. The water required for the decomposition of the amalgam is also fed to the pump well, both mercury and water being elevated by the pump to a transverse trough. The mercury in the bottom of the trough flows back into the decomposer section of the cell, while the water escapes through a pipe into the denuder or oxidising section. Thus the distilled water added to the denuder section is maintained in exact proportion to the quantity of mercury passing through.

The sodium hydroxide formed in the denuder section completely fills the space around the pan, finally escaping through a pipe by way of a hydrometer chamber to final discharge. By introducing a steam pipe into the space underneath the pan the temperature of the caustic soda solution is maintained at about 95° C., so preventing any crystallisation and enabling a higher strength of caustic solution to be discharged.

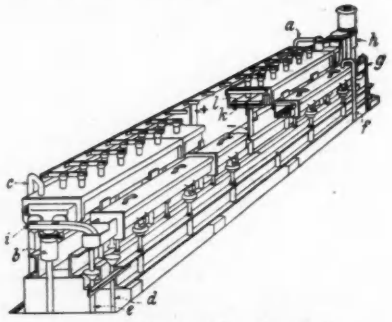

Fig. 5.—Krebs Mercury Cell.

a, Entrance inlet for brine electrolyte; *b*, Outlet for brine electrolyte; *c*, Outlet for chlorine gas; *d*, Outlet for concentrated lye; *e*, Outlet for impurities; *f*, Outlet for hydrogen; *g*, Inlet for decomposition water; *h*, Mercury conveying device; *i*, Gutter for sodium-charged mercury; *k*, Cathode; *l*, Anode (MANTELL).

The Krebs Cell

This cell has found application in various places, although the first plant was installed in the U.S.A. only about three years ago. A capacity of 275 tons per day and a high-purity caustic product suitable for the rayon industry prompted the Michigan Alkali Works to introduce cells of this type at Wyandotte to be the first installation of this type in the U.S.A.

The decomposer section consists of a long rectangular trough of ebonite or rubber-covered steel, in the lower surface of which sockets are inserted. The mercury, flowing along the base of the compartment, is in direct contact with these sockets, which are made cathodic. The anodes are long flat graphite plates held close to the mercury surface and connected to graphite rods passing through the roof of the section. Saturated brine enters the section at the same end as the mercury, the two flowing through the cell in the same direction, chlorine gas being withdrawn through an uptake at the opposite end. The brine is discharged and recycled while the mercury flows to the denuder section for decomposition of the amalgam (Fig. 5). The cathodic section is formed by a rectangular steel trough parallel to and of the same length as the primary section. Hydrogen is liberated, escaping through an uptake at one end, the mercury flows to a pump which elevates it to the anodic section, while caustic solution is withdrawn through an outflow near the mercury feed point.

(To be continued.)

Rock dust, the most effective preventive of mine explosions, is being increasingly utilised in America. The Bureau of Mines reports that since 1930 the quantity devoted to this purpose has more than doubled, rising from 137,000,000 to 344,000,000 lb. in 1941, the latest year for which figures are available.

Safety in the Laboratory

A Few Timely Reminders

by JOHN CREEVEY

ACCIDENTS are not peculiar to the works; in due proportion they occur in the laboratory, even in a laboratory that concerns itself with no work more exciting than routine analysis. An experimental laboratory may be expected to have uncertain happenings at times, and with the varied nature of work and means to accomplish it, a greater incidence of risks of all kinds might even be expected, though this does not, in fact, prove to be the case. Possibly the worker in an experimental laboratory or one engaged in the manufacture of small batches of fine chemical products may be particularly careful (as a natural consequence of the training he has received), as distinct from the worker out on the plant. Nevertheless, accidents in the laboratory do make it needful to call the attention of the workers there to certain things, and to remind them of the days when they were students in the college laboratory, for there, with a medley of all types working side by side, a wealth of experience in what was unsafe was available to those who were observant of others.

Fire Precautions

For avoiding fire, it is advisable that large batches of inflammable liquid should be heated without the use of naked flame; if the temperature of a water bath or brine bath is not sufficiently high, then use an oil bath; in both cases the bath can be heated electrically and provided with thermostatic control, and an oil bath need not be the messy affair too common in the college laboratory. This precaution is advised particularly for large batches of ether and carbon disulphide, but there are other inflammable solvents with which extra cautious heating may avoid a serious accident. It is not just a case of being careful with the use of the naked flame; indeed, with due care nothing may happen, but it is well to remember that a large batch of such a product as ether or carbon disulphide (at boiling temperature) may be difficult to deal with sufficiently rapidly to prevent a fire from spreading to other combustible material, apart from the fact that there is also the risk of a serious explosion. Where the lay-out of the laboratory permits, a separate room might be set aside for work which involves the heating of inflammable liquids and for other outstanding fire risks. Such a room would not only avoid all use of naked flame, but would also have the additional precaution of vapour-proof safety-pattern electrical apparatus, and would possess ventilation adequate to carry off any unexpected accumulation of inflammable vapour.

The advantage to be gained by adopting electrically heated baths for particularly inflammable liquids is emphasised where heating is accompanied by continuous agitation. If for any reason agitation is stopped it will usually be found that overheating starts, and when the agitator is set going again there is a sudden boiling-up, often a boiling-over, of the superheated liquid, such that a fire could never be avoided in the presence of naked flame. Every chemical laboratory should be provided with at least two fire extinguishers: a foam extinguisher is preferable if a fire of any considerable extent is anticipated. Let it be observed, however, that the tetrachloride extinguisher —while very useful for catching a sudden outbreak before it spreads—can be hazardous where ventilation is not good, for when carbon tetrachloride is sprayed into a fire small amounts of phosgene are formed, and the fumes of phosgene are dangerous to those who breathe them.

Again recalling reminiscences of college days, it is handy to have a useful piece of rag within reach when heating any liquid that may take fire, for in such an event—with presence of mind and determination—the rag can be pushed down upon the opening of any piece of apparatus to exclude the air and smother the fire in its early stage. Likewise, the laboratory should be provided with a fire blanket for personal protection, if fires are at all likely.

Goggles and Gloves

Goggles and gloves are provided to protect the worker on the plant; their need in the laboratory is just as great, for a small spurt of acid or alkali reaching the eye can be just as serious as a spurt from a large manufacturing vessel, and the use of a pair of goggles when circumstances demand it will prevent eye injury. Apart from acid-resisting rubber gloves of the short gauntlet pattern, leather gloves will be found particularly useful in the laboratory for the handling of hot apparatus which is too heavy for tongs; the use of the hands suitably protected by gloves is surer and safer than large tongs or any makeshift protection afforded by a glass cloth. Experiments which involve any risk of explosion, with the shattering of glass apparatus, should never be performed without goggles. Again, remember that goggles must be comfortable, as they may have to be worn for a longish

period; they must be of a pattern designed for safety use at chemical works, with glass strong enough to withstand the force of explosion, and with ventilation so placed that the entry of corrosive liquid will be avoided; some goggles, of course, have to give complete protection and have no ventilation holes, but where such are needed they usually form part of a complete face-piece with breathing canister or oxygen supply for use in the presence of dangerous gases. Rubber gloves prove very acceptable when washing apparatus with acids or alkalis. The rubber must be of a grade suitable to give protection against chemicals, and when the gloves show signs of deterioration they should be discarded; it is unwise to patch a hole in a rubber glove, for the adhesive medium may fail at an unexpected moment.

Handling Glassware

Cuts from breakage of glassware can be avoided by care in handling glass. When removing a large beaker the use of both hands placed under the rim of the beaker will prevent undue strain. In the erection of glass apparatus remember that clamps should never be tightened more than is necessary to hold the glass in position, for there is expansion to allow for, and, in the actual assembling, alignment has to be adjusted without strain on the glass, particularly on the fused-on joints. For cutting glass tubing use a sharp file, and when severing the pieces it is well to protect the hands with a cloth; also use a cloth when inserting glass tubes through a stopper, irrespective of whether the stopper is rubber or cork, and in the case of a rubber stopper see that the glass is lubricated to prevent undue strain and breakage. Those who regard these suggestions as common knowledge and exaggerated caution may find it salutary to recall the last occasion when they suffered a painful cut on the hand.

Vacuum Accidents

The use of vacuum in the laboratory gives a rather higher number of accidents than does the use of pressure. The collapse of glassware used in distillation under vacuum may be expected unless the glassware is of the highest quality and of sufficient thickness to withstand the pressure of the outside air. Flasks used for vacuum distillation must be round-bottomed, never flat-bottomed, and any that show optical distortion when held up to view should be discarded, as the uneven surface and defects from internal strain predispose them to sudden collapse. Care should be taken in setting up the assembly, and to avoid any obstruction of the condenser. Remember also that glass may be scattered widely when a flask collapses under vacuum, and that here is a case where goggles should be worn. Desiccators are also likely to collapse when under vacuum, and should be protected for carrying and standing by a wooden box with the stopcock projecting through an outlet and the lid secured.

When using pressure apparatus, see that gauges are maintained in good working order and that vents, with weight operated valves, are inspected each time the vessel is opened, in order to make sure that there is no obstruction resulting from previous usage. Cylinders of compressed gas should be clamped to a cylinder truck, so that they are always in upright position ready for use and easy to move from place to place as required in the laboratory. When they are not actually in use, the valve cap must be replaced; this cap is provided to protect the valve from external injury, and also to keep foreign substances from coming in contact with the valve orifice, from which they would subsequently be carried in the stream of gas, thus giving rise to possibly hazardous conditions. If it is necessary to take the precaution to clear the valve from particles of dust, by opening it momentarily, see that the stream of gas is projected in a direction and under conditions where it can do no harm. Moreover, develop the habit of opening and closing the valve slowly, and when it is found necessary to tighten any connection between cylinder and reducing valve to stop a leak, always take the precaution of first closing the main valve on the cylinder.

MERCURY FULMINATE DERMATITIS

With the purpose of reducing the incidence of mercury fulminate dermatitis in the explosives industry, two workers in the United States Public Health Service have produced a liquid soap which, by a change in colour, shows the presence of traces of the mercury compound upon the skin. Details of the composition of the soap are given in *Public Health Reports*, 1943, 58, 1183. The soap contains diphenylthiocarbazone 0.18 gm.; triethanolamine 250 ml.; liquid soap, 750 ml.; hydroquinone, 0.015 gm.

The soap is orange in colour and in the presence of traces of mercury salts it changes rapidly to a deep, easily recognisable purple. The triethanolamine brings the mercury fulminate into solution and the change of colour is produced by reaction with the diphenylthiocarbazone. One drop (about 0.05 ml.) of the reagent soap solution will indicate the presence of 0.000002 to 0.00001 gm. of mercury ion per square centimetre.

Industrial Safety Gleanings

Some Dangerous Industrial Vapours

A NUMBER of useful notes connected with safety in chemical works appeared in the March-May issue of the *Industrial Accident Prevention Bulletin*, the organ of ROSPA, publication of which was considerably delayed by the serious illness of the editor, Mr. H. G. Winbolt, and the absence of his assistant, Mr. McKown, on active service. The first of these applies directly to Mr. John Creevey's warnings, in our September "Safety First" issue, concerning gas poisoning.

A covered degreasing tank, conveyor-fed, was being cleaned. All the trichlorethylene had been distilled off and as much as possible of the liquid sludge drained. An exhaust fan had then been left running, drawing air right through the tank for 8½ hours before a worker entered to clean out the remaining sludge. A second man was solely engaged in keeping him under observation. *Neither life-belt nor breathing apparatus* was worn by the man in the tank. He suddenly collapsed, and when his mate tried to pull him out he also collapsed, fortunately outside the tank. The sequel was happier than might well have been the case, for a rescue was effected, but one of the men spent ten days in hospital. The firm was fined £20 for contraventions of Section 27(1)(*b*) of the Factories Act, 1937, which deals, *inter alia*, with the provision of life-belts and breathing apparatus.

In another reported instance, a trichlorethylene degreasing plant had been installed in the centre of a very lofty shop and the flue from the burners terminated about 10 feet from the floor instead of passing through the roof. The plant had just been cleaned out and the replacement of a faulty washer caused a slight leakage of trichlorethylene from the tank. A basin was placed on the ground to collect the liquid and the fumes from it were drawn through the combustion chamber. It seems highly probable, to say the least, that phosgene was produced by the passage of the fumes through the hot chamber and escaped from the top of the flue. At any rate, two girls working about 20 feet away were gassed, though fortunately without serious effects.

Naphtha Hazards

A number of firms, to-day, are making use of solvent naphtha for the first time. This is a material not without its hazards, and several points are worthy of careful consideration. There are, in the first place, two types of naphtha in industrial use; the petroleum product and the coal-tar product. Naphtha from petroleum has an anæsthetic action if breathed in high concentrations. This effect brings with it headache, blurred vision, mental confusion, inability to do fine work, sickness, abdominal pain and, in extreme cases, loss of consciousness. It is emphasised that these effects are only caused from high concentration.

Solvent naphtha is a mixture of coal-tar products such as toluol, xylol, and even the heavier cresols. The toxicity of the coal-tar naphtha is an entirely different matter from that of petroleum naphtha and much more serious. Much recent research has been undertaken to establish the maximum amount of these substances in air which it is safe to breathe. It has been suggested that the figure for the solvent variety should be placed somewhere between 150 and 200 parts per million. Such figures must always be taken with extreme caution, and it is a safe general rule where any organic solvent is used that the freest possible general ventilation should be supplemented by localised exhaust as near as possible to the point of origin of the fumes.

It should not be overlooked that naphtha, whether derived from petroleum or from coal tar, may lead to dermatitis. All operations involving use of naphtha should therefore be arranged in such a way as to prevent the naphtha from coming into contact with the skin in appreciable amounts and for long periods.

Ethylene Dichloride

The hazards of ethylene dichloride have prompted the publication in the U.S.A. of an Industrial Data Sheet (No. D. Chem. 41) and the subject is dealt with also in *National Safety News*, *46*, 2, p. 52. Poisoning can occur through breathing the fumes, and skin affections may result from physical contact.

Ethylene dichloride ($ClCH_2.CH_2Cl$) is also known as 1,2-dichloroethane and ethylene chloride. It is a colourless liquid with an ethereal odour, molecular weight 98.97, specific gravity 1.25. Boiling and freezing points are 83.7° C. and 35.3° C. respectively. It is practically insoluble in water but is miscible with ethyl alcohol and ether. It is often used in metal degreasing, in cleaning fluids, in grain fumigation and as an extractor for oils, fats and natural waxes. For the extraction of nicotine from tobacco and caffeine from coffee, in the synthesis of some products, particularly rubber and tetraethyl lead, and as a spotting agent in the textile industry.

Studies have not yet been completed on the effect of prolonged exposure of the human body to ethylene dichloride. It is known, however, that the effects are in general

similar to those produced by allied solvents, such as carbon tetrachloride, trichlorethylene, and chloroform. These effects are usually the results of breathing the vapours. The immediate symptoms which result from breathing high concentrations, or from breathing lower concentrations for some time, are narcosis, nausea, dizziness, weakness, and irritation of the eyes and upper respiratory tract. If exposure to such concentrations is sufficiently high and prolonged, death may result. Skin affections caused by ethylene dichloride resemble those caused by most fat solvents. The natural skin oils are dissolved when it comes in contact with the skin. Erythema (redness of the skin) follows. The skin, lacking the protection of its natural oils, is more susceptible to infection from other sources. Pimples and small water-filled blisters may occur.

The maximum concentration of ethylene dichloride in air which can be safely breathed for continuous exposure is not established. It is suggested that concentrations in the air breathed by workers be kept at or below 100 parts per million parts of air (by volume). All processes employing ethylene dichloride should either be completely enclosed and under partial vacuum, or they should be provided with an exhaust system, or with some other control system that will keep the concentration of vapours at a safe level. Dilution is *not* accepted as adequate in British factories.

Where the skin may be exposed to splashes of ethylene dichloride, a barrier cream or lotion may be applied on the hands, forearms, face, and neck. However, too great dependence should not be placed on such protection, and it is better to guard against direct contact with the skin. For first aid, a person showing ill-effects from breathing the vapours should be immediately removed to open air. If breathing has ceased, artificial respiration should be started at once and continued until breathing is normal. If the compound is accidentally swallowed, an emetic should be given and the services of a doctor secured at once.

New British Standard

Economy of Soft Solders

AN Appendix to B.S./STA.7—Economy of Soft Solders—which has just been issued by the British Standards Institution for the Ministry of Supply, deals with specifications for solders, particularly from the aspect of economy in the tin content. The recommendations have been prepared by an Advisory Panel of the British Non-Ferrous Metals Research Association, under the chairmanship of Dr. H. Moore. The solders are classified in four series: Sub-Series A — Lead-silver alloys (three solders); Sub-Series B.—Lead-tin-antimony alloys (two solders); Sub-Series C.—Lead-tin and lead-tin-antimony alloys with small additions of silver (six solders); and Sub-Series D.—Lead-tin and lead-tin-antimony alloys (five solders). Guidance as to the choice of an appropriate solder, and suggestions for the uses for which the various solders are appropriate are given. Copies are available from the B.S.I. at 6d. each, or 3d. each for 12 or more.

The Future of Coal Products

Meeting of Low Temperature Carbonisation, Ltd.

SPEAKING at the annual general meeting of Low Temperature Carbonisation, Ltd., in London recently, the chairman, Colonel W. A. Bristow, pointed out that although the profit for the year had been increased, this was not due to the manufacture of special war products. Although practically all the liquid products were at present being utilised for war purposes, they were all equally necessary in peace and were valuable products of national importance. The increased profit was due to the fact that, thanks to the assistance of the Ministry of Fuel, more coal had been forthcoming, and the value of the liquid products had been enhanced as a result of research.

"Quite recently," said Colonel Bristow, "the Minister of Fuel and Power has spoken of the need for the more scientific utilisation of coal, and the Parliamentary and Scientific Committee has also issued a report on the same lines. I suggest, therefore, that this company has grounds for satisfaction, having already demonstrated what great benefits can be derived from the conversion of bituminous coal into many valuable products instead of burning it and allowing much of its value to be disseminated over our towns and countryside in the form of poisonous smoke."

The company had for some time been making the essential raw materials for the plastics industry and they were supplying some of the leading firms in that industry. There was no doubt that coal derivatives were going to play a leading part in the plastics and rubber industries of the future. In conclusion, the chairman said: "There is no doubt whatever that this company should have an important share in the future. After this war smokeless fuel, coal oils, and the chemical industry based thereon will be afforded the chance for which it has waited for years, but we must have national planning combined with as little control as possible. In my opinion, if these basic requirements are not forthcoming the future will indeed be grim. It is our responsibility to ask that they shall be provided, not only for the safety and benefit of the industry but in the interests of the community as a whole."

Industrial Health

Points from the Factory Inspector's Report

THE annual report of the Chief Inspector of Factories for the year 1942, which has just been published by H.M. Stationery Office (price 9d.), contains certain sections of particular interest to the chemical industry, notably in the portion, by Dr. E. R. A. Merewether, devoted to Industrial Health. Despite the addition load on the individual's powers of resistance, induced by various aspects of war conditions, the nation's health, looked at from the industrial angle, is quite satisfactory; but the Factory Inspection department are continuing to be wary and watchful to remove or ameliorate harmful factors which react adversely on sections of workers. There is a great and growing public opinion, stimulated by war necessities, of the need for Industrial Health Services.

During the year, the medical staff of the Ministry of Supply paid special attention to the problems of dermatitis in the Filling and Explosive Factories and a very substantial drop in the total cases of industrial dermatitis due to tetryl, T.N.T., fulminate of mercury, and white spirit has been achieved. This has been due to strict supervision of ablutions, the correct application of barrier substances, the gradual elimination of specially susceptible workers, and the development and mechanisation of many processes. Only approximately one-fifth of the total cases of dermatitis have had to be taken off work, the remaining four-fifths having cleared up when moved to alternative employment. With reference to T.N.T. sickness other than dermatitis, the incidence of anilism and toxic gastritis due to T.N.T. has also been considerably reduced, and the number of cases of toxic jaundice and aplastic anæmia due to T.N.T. is also less as compared with the previous year.

Radio-Active Substances

Very close supervision has been maintained by the Factory Department over the use of radio-active substances, which has so greatly expanded owing to war requirements, chiefly for luminous dials for instruments. The whole time of one medical inspector has been occupied with clinical and hæmatological examination of workers exposed to these substances and also of workers exposed to various toxic solvents. During the year several hundred luminisers were examined more than once in this way. No evidence of a true aplastic anæmia was found. These examinations are giving much valuable information by which to assess the effectiveness of the Factories (Luminising) (Health and Safety Provisions) Orders. A further check was initiated by the examination of the air exhaled by workers for the emanation of the radio-active substances.

The general principle underlying the causation and prevention of dermatitis in industry are well known and applied with effect. Preventive measures—such as careful washing and the application of suitable barrier preparations to the skin—depend for their effectiveness in practice, however, on the unflagging co-operation of every worker, which is a standard of human behaviour one can hardly expect in the circumstances. In fact, it often requires an attack of dermatitis, with the associated risk of an increased susceptibility developing, before the lesson is learnt by the individual worker. There is room, therefore, for a more intensive study of processes in which there is a pronounced risk of dermatitis, from the angle of precise identification of the irritant factor and its removal or neutralisation, or substitution of the substance containing it by a non-irritant or less irritant substance. These are not new methods of attack, for they are applied, for example, by at least one manufacturer of cutting oils, and to an extent in the choice of accelerators in the indiarubber industry. This is only one example of the many intricate problems in connection with this important and increasingly complex subject. The formation of a small Advisory Panel on Dermatitis in Industry was therefore approved. Not only Dermatology, but Chemistry and General Medicine, were represented on the Panel, together with medical members from the Ministry of Health and other Government Departments (Ministry of Fuel and Power and Ministry of Supply) most concerned with this subject. The Panel has already contributed considerably to the prevention work in this field. Some advance was made during the year in defining measures for the prevention of dematitis, and particularly in the scope and degree of protection afforded by the use of "barrier preparations." Inquiry was also made into the effects on the skin of synthetic glues, used chiefly in the aircraft industry, and recommendations made.

Toxic Anæmia

During the year 14 cases (three fatal) of toxic anæmia were notified, seven being attributed to T.N.T. with the periods of exposure varying from five to 18 months. The other seven cases were associated with mixtures of solvents containing low proportions of benzene used in rubber solutions, and in one case aeroplane dope with less than 15 per cent. of benzene in the mix-

ture. It may be argued that such cases may well have been classified as chronic benzene poisoning, but as the symptoms were mild and transient, in most cases only necessitating transfer to non-contact work and, as they did not present the classical signs of purpura and hæmorrhage from mucous membranes, they invite further study as to the causal factors, and emphasise the importance of making toxic anæmia a notifiable disease.

Lead Poisoning

There was a slight rise in the cases of lead poisoning notified in 1942, as compared with 1941 which had the lowest figure so far recorded. The number remained, however, well below the general level of the later pre-war years. Some 16 out of 43 workers were affected by cordite fumes and lead nickel dust produced by the impingement of bullets on deflection plates and continuously blown back into a workroom through the firing apertures of a modern short-distance testing range. Adequate ventilation, rendering the operation dust-free by a method devised of firing against a stream of water, prevented any further cases. One case of mercurial poisoning due to phenyl mercuric acetate was notified. The six cases of arsenical poisoning notified were attributable to arsenical sheep dip in its manufacture, white arsenic, and arsenious oxide.

The number of cases of aniline poisoning notified decreased from 249 in 1941 to 204 in 1942. Of these 167 were attributable to T.N.T. and one to 5-chlor-ortho-toluidine. The one notified case of chronic benzene poisoning which ended fatally in 1942 occurred in a female aged 23. The anæmia was first notified in 1939 and was attributed to exposure to rubber solvent said to contain more than 5 per cent. of benzene. Estimation of the benzene or of a mixture of benzene and toluene in the air in the vicinity revealed 1 part in 10,000.

It is now possible to make useful comparison of the figures for T.N.T. toxic jaundice in this and the last war. Toxic jaundice was not notifiable until January 1, 1916, so no figures are available for the first 17 months of the last war. In the ensuing 36 months until the end of 1918, there were 403 cases notified, of which 105 were fatal. In this war, for the 40 months which elapsed up to the end of 1942, the figures are 85, of which 20 were fatal. That is to say that the incidence in this war is only approximately 10 per cent. of that in the last war, in spite of greater production. The improvement continues. The number of cases of toxic jaundice notified in 1942 has decreased, 27 (six fatal) as compapred with 44 (13 fatal) in 1941. Of these 26 (including five fatal) were attributable to T.N.T., while the other fatal case occurred in a female aged 41 employed in scraping off redundant chlorinated naphthalene wax used as a masking agent for metal parts prior to chromium plating.

There was a further reduction in the number of notified cases of epitheliomatus ulceration—113 (eight fatal) as compared with 128 (11 fatal) in 1941. Of these 85 (two fatal) were due to pitch and tar, and 28 (six fatal) to mineral oil. The number of cases of chrome ulceration decreased from 103 to 89.

Reported cases of gassing show a slight reduction, being 776 as compared with 782 for 1941. The number of cases which proved fatal is, however, much less, being 25 as against 41 in 1941. Nitrous fumes were responsible for 220 of these cases, but there were only two deaths. But for a considerable increase (116 as against 65) in cases due to producer-gas and 31 additional cases from nickel carbonyl, a considerable reduction would have been recorded. A case of phosgene poisoning was attributable to the use of a fire extinguisher containing carbon tetrachloride.

A fatal case of gassing by sulphuretted hydrogen which occurred at a chemical works was of particular interest. Owing to a misunderstanding, sulphuric acid was allowed to overflow from a trough and came into contact with sodium sulphide on the floor and in the drains causing evolution of sulphuretted hydrogen which travelled to the upper floor and caused the collapse of a female process worker aged 35, who was engaged there in sweeping the floor. Two operatives collapsed during attempted rescue but a third succeeded in rescuing the others although he, too, was somewhat affected in spite of wearing a gas mask.

Silicosis

An example of the Department's method of dealing with a particular problem was quoted by the Chief Inspector, Sir Wilfrid Garrett. Work is now in hand concerning the growing risk of silicosis in steel foundries through the rapid expansion of steel casting due to the war and the pressure on the men concerned. Here the risk is apparent and the difficulty is the technical one of suggesting practical methods by which is can be overcome without interruption of the war effort. After conferences with both sides of the industry a committee was set up consisting of representatives of employers, trade unions and a university technical expert, with inspectors, including engineering and medical, who have a special knowledge of the trade. The report of a similar committee that dealt with the dangers of silicosis in the preliminary process of that part of the pottery industry engaged in the making of dust tiles and electrical porcelain fittings was completed during the year.

Research and Development

Future of the Chemical Industry

INTERESTING observations on the future of the chemical industry were made by Lord McGowan at a joint meeting of the Chemical Engineering Group, the Institution of Chemical Engineers, and the London Section of the Society of Chemical Industry, held on Tuesday at the Institution of Mechanical Engineers, Storey's Gate. Lord McGowan said the first requirement for the industry was to create and maintain the maximum flow of inventions. This could only be brought about by the most energetic and intelligent prosecution of research. The national research effort was shared between the universities, industry and Government.

While it was a mistake to saddle the universities with research which properly belonged to industry it was equally wrong to set up any barrier between university and industry. The more each knew of the other the better for both. "It would be to the good of all," said Lord McGowan, "if from time to time university workers were hauled gently to the ground in order to observe the functioning of life at the lower levels: and for industrial workers to be hoisted equally gently so that they may be given a clearer view of the stars of the scientific firmament."

Research in Industry

Industry's responsibility in research was to investigate problems with which industry was concerned and its efforts were mainly centred in the research associations and the larger industrial concerns. The research needs of chemical manufacturers were too many and varied to be covered by any one chemical research association. What was needed was a far greater measure of research co-operation between firms. There was also the problem of the small firm whose resources were likely to be insufficient to permit it to undertake adequate research. Though such firms could not look for help to a research organisation of their own, there was room for some organisation to help them. In this connection Lord McGowan noted the work of the Mellon Institute in the U.S.A. In addition to fundamental and industrial research there was a vast job of work which could and must be done under Government auspices. This included problems of national concern but not necessarily of any direct commercial interest. Coal was an outstanding example.

The future of coal was anything but bright, and two unpalatable facts should be remembered. First, during the past six years the cost of winning coal in Britain had risen no less than 70 per cent. Secondly, pit prices of coal in the U.S.A. were lower than corresponding British prices by about 10s. per ton: that is, by an amount little less than half our pre-war price. A further cause for uneasiness was the decline in coal output. Current rate of production was about 190 million tons per annum as compared with an average for the period 1933-1938 of 224 millions. The responsibility for organising a research programme of the required magnitude clearly rested with the Government.

Patents

A second point of importance to the chemical industry concerned patents and their exploitation. There appeared to be a feeling, Lord McGowan said, that because companies and individuals could at present obtain exclusive licences for a particular process they were in a position either to sell the product at a higher price or suppress it altogether if it threatened processes in which they were already interested. It had been suggested that the system of exclusive licences should be abolished and superseded by one of non-exclusive licences obtainable as a right by all wishing to secure them. The adoption of such a proposal would not have the effect intended. First, the grant of non-exclusive licences only would lead direct to unrestricted competition and to manufacture in small units and at high costs. Secondly, it would lead to a great increase in the operation of inventions as secret processes—with the most unfortunate effect. In any event these matters were taken care of by the existing Patents Act itself which would be obvious to anyone who took the trouble to read it.

Development

Another aspect of the chemical industry which needed careful attention was what, for want of a better name, was known as development, *i.e.*, the conversion of research results into commercial processes. The development stage of a product might cover a number of years before the merits of it could be accurately assessed and the most advantageous form in which it could be used determined. Although distinct in their functions, research and development were so closely interlocked that it was frequently impossible to tell where one ended and the other began. For a number of years it had been increasingly realised in the chemical as in other industries that technical service to customers was indispensable to sales organisation. The importance of such service applied equally to export and to home trade. Indeed, in export trade the personal factor could not be over-emphasised.

Intelligence Services for the Chemist

S.C.I. Symposium — Some American Methods

THE importance of technical intelligence and library services to industrial chemists was acknowledged by the very large attendance at the meeting of the London section of the Society of Chemical Industry held in the Chemical Society's rooms on October 4. The main paper, entitled "The Organisation and Use of Technical Intelligence Services," described the work done at the Imperial Institute and was given by the principal of the Mineral Resources Department, Mr. S. J. Johnstone. He said that there were now in Britain over 100 technical intelligence services, issuing periodical abstracts, bibliographies, and other information. The chemist in the small works, however, often did not have the time to look through bibliographies in order to locate possible sources of the data he required, and it was here that the special services provided by such organisations as the Imperial Institute formed a useful adjunct to the chemical profession. With the intelligence services of the Institute were coupled the library and laboratory services. An intelligence section was formed in 1895, but most of its work was transferred to the laboratory staff in 1903. Eleven years later the technical information bureau was formed, the laboratory staff continuing to deal with the more important inquiries.

The Imperial Institute's Value

On the amalgamation of the Institute with the Imperial Mineral Resources Bureau in 1925, two departments were set up, one dealing with plant and animal products and the other with minerals. Liaison with the laboratory staff was maintained, while a statistical group was added to assist both departments. The factors which contributed towards the efficiency of the intelligence service were the accumulated experience of the staff over fifty years, the library, the statistical section, the technical index, the reference collection of products, and the consultative committees connecting the Institute with commerce, industry and science. Technical periodicals from the United States, European countries, and the Dominions and Colonies were received by the library at the rate of over 26,000 issues a year. Most of these were filed without being cut. The technical index covered a period of 40 years, and the individual entries carried not merely the reference but an abstract giving some idea of the length of the original article, whether it was illustrated, and whether it contained a bibliography. The index cards also showed where it was possible to obtain a copy or an abstract. This extra work was worth while, as it saved time when consulting the index afterwards. In the reference collection there was a sample of every mineral examined at the Institute during the past 40 years, and any particular sample could be traced within half an hour.

Mr. Johnstone made some interesting remarks about the qualifications needed in intelligence officers. The mineral department recruited these officers from among men with fundamental training and a university degree, who had specialised for several years and had had practical experience abroad in geology or mining work. It took about two years to train a man before he could take up his full responsibilities. A special type of mentality was required, coupling the persistence of the research worker with an ability to switch rapidly from one subject to another. The practical outlook, too, was most desirable. The assistants who compiled the technical index needed a good knowledge of foreign languages with some geological or chemical training. Those using the Institute's intelligence service should make their demands as specific as possible (Mr. Johnstone quoted the case of an inquirer who wanted information on "possible uses for mica" without giving a clue as to what type of mica he had in mind), and tell the intelligence officers whether the information they supplied was useful or not.

Librarians' Views

Dr. J. C. Withers, librarian of the British Cotton Industry Research Association, said that Dr. A. W. Crosby, who planned their library, intended it to be *The* Cotton Library for the use of research staff needing botanical, chemical, and statistical information. It published some 180 abstracted items each fortnight, and these abstracts covered a wide range of subjects; for instance, a paper on the vitamins in perspiration was included because it gave data about perspiration that might be useful in the textile industry. He thought the value of abstracts should be judged by their *range* rather than their promptitude.

Miss E. W. Parker, librarian of the Research and Development Department of the Mond Nickel Company, said that most of the inquiries she received came from the staffs of her company. Her index included 250,000 references to work on all branches of metallurgy, and 4500 patent references. These were arranged by subject, but there were also author indexes to both papers and

patents. Coloured cards were used to differentiate between the different subjects; for instance, patents had red cards, research green, and so on. Index cards also carried an abstract of the individual paper. The paper in full," added Mr. Horn. He concluded by saying that it was impossible for his library to keep original papers more than about ten years old, and the way to save space but still preserve a copy of the original

The library attached to the laboratories of J. Lyons & Co., Ltd.

minimum standard for an assistant in this library was matriculation in physics, chemistry, French, and German. Another useful feature of such a library was the preparation of a " running " bibliography.

Mr. Freeman Horn, intelligence officer of the British Aluminium Company, said an intelligence officer required to know where to find information rather than to be well-informed on any particular subject. Unlike the specialist, he had to know " less and less about more and more." In peace time his company produced two abstract journals. The first, *Light Metals Research*, dealt with production and was intended only for men in the industry. The other, *Light Metals Review*, was sent to development engineers and sales officers throughout the world, and to everyone interested in developing new uses for light metals. With regard to abstracting, Mr. Horn denied that there was a great deal of overlapping. Different kinds of abstract served different purposes; scientific abstracts gave a balanced picture of the subject, whereas industrial abstracts picked out those parts of an article or research paper that were of interest to the industry. " I believe also in the *directive* type of abstract, giving what is in the original paper without giving details. The object of these abstracts is to benefit the research worker who has access to the original. The industrial abstracts are for the benefit of the development engineer and the salesman who require technical information but have not the same access to the original. I often give these men a particular portion of a

was to use microfilm, which he planned to use on a large scale after the war.

Miss M. Shaw, who runs the library and information service attached to the laboratories of J. Lyons and Co., Ltd., recommended the use of the Universal Decimal System for books. Differential colour cards were used for the index, which contained 50,000 references. The Lyons library contained 1200 reference books, as well as many pamphlets, reprints, etc., and 90 periodicals were regularly received. Laboratory reports were also filed in the library. To simplify the work of answering inquiries, all correspondence to the laboratory passed through the library. Miss Shaw expressed the view that too much spoon-feeding was bad for chemists, adding that it was desirable that research workers should consult the original paper.

Mr. B. Fullman, information officer to the British Non-Ferrous Metals Research Association, said that his organisaton produced a monthly bulletin, which did not attempt to provide abstracts but instead gave notes on the more important points from research papers, etc., with the aim of titillating the reader's interest. They had concentrated on the library service, which was made as efficient as it could be through constant contact with fifty other libraries. He thought there was a large future for microfilm, though not so large as some people believed. His library already had a microfilm reader. Inquiries were the concern of the development section; an officer particularly interested in the subject of the inquiry would be

in charge of the investigation, and would decide which members of the research and intelligence staffs would be able to provide relevant information. Everyone coming in on the particular job would receive a copy of the inquiry and would afterwards send his report to the officer-in-charge. If this method failed then some practical work would be undertaken in the laboratories, and where several inquiries requiring experimentation came in upon the same question they were often given a good clue to future large-scale research projects. The results of such research were published as confidential reports, for circulation among members of the research association. In addition, confidential development reports, giving an interpretation of the research results for the benefit of industrialists, were prepared by the development staff.

American Practice

It is interesting to compare with the opinions expressed above the recommendations of an American authority on the building-up of a chemical library. Miss Maude Ellwood, librarian to the Dow Chemical Company, offers some practical suggestions on the subject in *Chemical Industries* (*53*, 2, p. 189), starting with the assumption that a library is to be constructed where no library was before. The inauguration of a company or laboratory library is justified, she considers, by the existence of a staff of between 20 and 30 technical men. The organising committee should be formed of the heads of the departments that will make the greatest use of the library, and the chairman of such a committee should be an executive who is well informed of the research and development programme in hand. In choosing a location for the library considerable room for expansion should be allowed from the outset, and adequate and suitable furniture and lighting should be provided.

Miss Ellwood considers the selection of a competent librarian to be the most important step of all, and deprecates the appointment of a person who has outgrown his usefulness in some other capacity. Essentials include a fundamental knowledge of chemistry, a reading knowledge of French and German, some knowledge of economics, and a year of library-school training. Her definition of the characteristics to be desired in a special librarian approximates closely to the demands of her British confrères. "The special librarian," she says, "should be alert for new developments, persistent in tracking down information, and able to see the relations between the material which is dealt with and the problems which arise." In her opinion, by far the most important part of the collection in a chemical library is the periodical literature. Five other heads should also be included, *viz.*: Books; Government documents and pamphlets; trade catalogues; photostats, microfilms, and clippings; and patents. Periodicals are specially important because they contain accounts of the latest developments that have not yet found their way into books, and give a complete record of scientific discovery as it has developed. Government documents in the United States are probably more important to a chemical library than they would be in this country; but the trade catalogue is quite as essential here as there, and affords a source of information which is often neglected. The Dow library concentrates on a file of the strictly chemical catalogues, leaving the plant and equipment catalogues to the purchasing and engineering departments. The library should possess a microfilm reader, and photostats and clippings should be filed in vertical files under the subject, with the necessary cross-references.

The services which the library should be prepared to render vary with the size of the library staff and with the number of technical personnel. But at least a regular list of new acquisitions should be issued, with annotations if possible. Weekly abstracting of articles keeps the technical staff informed of what is going on in their several departments, and in order to do this the librarian must keep abreast of work in progress and in prospect. Routing of periodicals through the various departments is another useful service, and this implies subscribing for more than one copy of the same journal, one copy always remaining on the library file. Preparation of bibliographies and translations (whether within or outside the library) are other services that will be in demand.

Cataloguing

In a chemical library, classification and cataloguing of the books and periodicals, and even of the vertical-file material, should be carefully worked out. In the Dow library the Dewey Decimal System is used, though they have had to work out their own extensions of the system in their classifications for Organic Chemistry, Chemical Technology, and Metallurgy. The Library of Congress Classfication permits of infinite expansion, and is recommended for a collection that is likely to expand rapidly, or to include a wide variety of subjects. Even a small collection should be catalogued carefully, for then it becomes doubly useful. It is not necessary to go into elaborate bibliographical detail on the catalogue cards for a special library; but the subject matter of the book should be brought out in great detail by the use of "analytics" (card analyses of books by subjects) for the various chapters if necessary. The important objective is to bring book and user together with as little delay as possible.

Personal Notes

SIR JOHN GREENLY has retired from the Advisory Council of the D.S.I.R. on the completion of his term of office.

DR. W. A. MACFARLANE has been appointed Director of Fuel Efficiency in the Ministry of Fuel and Power.

MR. D. F. SANDYS WUNSCH has been appointed a member of the Advisory Council of Scientific and Industrial Research of New Zealand.

Next Friday evening MR. WALLACE P. COHOE will be formally installed as president of the Society of Chemical Industry at the meeting to be held in the Waldorf Hotel, New York.

A slight error occurred in our paragraph last week with regard to the recent appointments made by the British Drug Houses, Ltd. The name of the new managing director of this company is MR. F. C. OSCAR SHAW.

FLYING-OFFICER E. R. DAVIES, R.A.F., who before joining the R.A.F. was assistant analytical chemist at the National Smelting Works, Llansamlet, Swansea, is reported missing following operations over enemy territory.

A 29-year old research worker, DR. KENNETH SANBORN PITZER, of the University of California, has received the American Chemical Society's award in pure chemistry, being presented with the $1000 prize at the recent Pittsburgh meeting.

MR. THOMAS S. NICHOLS, vice-president of Prior Chemical Corporation, New York, has joined the Harriman Mission in London. For the past two years he has been connected wih the Chemicals Division of the War Production Board.

The Gold Medal of the Society of Dyers and Colourists has been awarded to MR. C. M. WHITTAKER, of Courtaulds, Ltd., a vice-president of the society and chairman of the British Colour Council, " in recognition of his exceptional services in promoting scientific and technical knowledge among textile colourists and for his sustained and outstanding service to the Society.

WING-COMMANDER ADRIAN WARBURTON, D.S.O., D.F.C. with two bars, nephew of Mr. R. A. Warburton, B.Sc., chemist with I.C.I. (Explosives), Ltd., has been awarded the American Distinguished Flying Cross. His uncle received the M.B.E. in March this year for entering a burning shed, which he knew contained explosives, and removing smoke bombs and containers of flaming chemicals. Another member of this family was Captain Warburton-Lee, who won a posthumous V.C. for his heroism in the battle of Narvik, when he lost his life leading his destroyer flotilla into action.

CAPTAIN JOHN A. BENN, prospective Parliamentary candidate for North Bradford, supporting a resolution at the meeting, on October 7, of the Central Council of the National Union of Conservatives and Unionist Associations in London, urging steps to safeguard the interests of small traders, said that in a healthy society a man must be free to express his individuality in his daily work, as his own master and as the servant of the community. The small trader represented all that was best in the English tradition—personal service to his customers, pride in his craft, pride in the quality of the goods he sold.

Directors of the new company in the South London gas industry, entitled the Greater South London Gas Corporation, Ltd., include members of the boards of the three gas companies operating in South London. MR. FRANK H. JONES is president and joint managing director of the South Metropolitan Gas Co., and chairman and managing director of the South Suburban and the Wandsworth and District. MR. A. M. PADDON is vice-president and joint managing director of the South Metropolitan, a director of South Suburban, and deputy chairman of Commercial Gas. The other directors, who are all connected with one or more of the three South London companies, are: MAJOR H. F. H. JONES, MR. B. R. GREEN, COLONEL C. M. CROFT, DR. E. V. EVANS, and MR. T. BROWN.

Obituary

MAJOR WILMOT DICKSON LONGSTAFF, reported missing in North Africa, is now presumed killed. Aged 35, he was managing director of Messrs. Blundell, Spence & Co., Ltd., the Hull firm of paint manufacturers.

The death is announced at St. Bartholomew's Hospital, London, on September 24, of MR. FRANCIS NAPIER SUTTON, at the age of 80. The eldest son of the late Mr. Francis Sutton, public analyst of Norfolk and Suffolk, and author of a well-known handbook on Volumetric Analysis, he studied under Roscoe and Watson Smith at Owens College. For a time he worked in his father's laboratory at Norwich, also acting as works chemist to Messrs. Baly, Sutton & Co., of Great Yarmouth. Then, in 1885, he became assistant to the Chief Alkali Inspector of the Ministry of Health, with which department he remained until his retirement in 1927, being in charge of the London and S.E. Counties district for 35 years. He was a Fellow of the Royal Institute of Chemistry, and served on the council of that body for two periods of four years. For 14 years he was hon. secretary of the old Chemical Dining Club of the S.C.I., and members of that Society will recall his colourful description of its activities at last year's general meeting.

General News—From Week to Week

The chemical laboratory of Eton College was damaged by fire last week.

The Laboratory Fund for the new Stalingrad Hospital now stands at over £1340. The Farnborough branch of the A.Sc. W. by itself contributed £98.

The Army Bureau of Current Affairs is sending round to units in all Commands an educational exhibit prepared by the Women's Gas Council and showing the multitude of products derived from coal.

The address and phone number of the British Chemical Plant Manufacturers' Association and of the Food Machinery and Chemical Plant Export Group are now changed to 26 Portland Place, London, W.1, and LANgham 3121.

Oilskin clothing for trailer pump crews of industrial and commercial undertakings may now be supplied coupon free. The sale by the Ministry of Home Security of dyed battledress for trailer pump crews will be discontinued.

The Ministry of Food announces that the Edible Oils and Fats (Control of Sales) Order, 1943 (No. 701), has been amended, with effect from October 10, 1943, by the exclusion of petroleum or any products of petroleum from the definition of "edible oil."

Two trade union leaders have been appointed to the Advisory Council of the D.S.I.R. They are: Mr. J. Benstead, general secretary of the National Union of Railwaymen, and Mr. E. Thornton, secretary of the United Textile Factory Workers' Association.

De La Rue Plastics, Ltd., has acquired all the shares in Hammans Industries, Ltd., and the interests of its associated companies. Mr. J. Eerdmans, a managing director of the latter undertaking, has joined the board of De La Rue Plastics. Hammans Industries is a private company interested in a wide range of plastic products.

The Jubilee Memorial Lecture of the Society of Chemical Industry was delivered at University College, Cardiff, last week by Sir Robert Robertson, the famous explosives chemist, who took "Diamonds" for his subject. Capt. James Griffiths, Lord Mayor of Cardiff, and industrial chemists from all parts of South Wales attended the lecture.

Scottish shale oil mixed with creosote oil from Glasgow Corporation Gasworks is helping to fill the gap left by the lost imports of Russian oil, according to Mr. E. R. L. Fitzpayne, manager of the Glasgow Corporation Transport Department. His vehicles were now using 3000 gallons of creosote oil per week, representing 10 per cent. of their total fuel oil consumption.

The Board of Trade index figure of wholesale prices for industrial materials and manufactures maintains its upward trend, having risen from 163.9 in August to 164.6 in September (1930 = 100). The figure for chemicals and oils increased by 3.4 per cent. to 150.4, the rise being mainly due to the price of crude palm kernel oil, which went up from £36 to £48 10s. a ton on August 30, and to a rise of 20½ per cent. in the price of soap.

A panel of technical advisers has been set up by the North of Scotland Hydro-Electric Board to assist in the drawing up of the development scheme showing the water power resources. Its members are: Mr. R. J. Beard, of Merz & MacLellan; Mr. S. B. Donkin, of Kennedy & Donkin; Mr. James Williamson, of Sir William Arrol & Co.; Mr. W. T. Halcrow, and Mr. Guthrie Brown, of Sir Alexander Gibb and Partners. The board may later decide to add one or two further names to the panel.

The Trading with the Enemy (Specified Persons) (Amendment) (No. 14) Order, 1943 (S.R. & O. 1943, No. 1365), contains 327 additions to the "Black List" of traders in neutral countries, including S.A. Química y Farmacéutica Vogel, La Unión, Chile, and Treupha A.G. für Chemisch-Pharmaceutische und Kosmetische Produkte, Brunnmattstr. 12 and Badstr. 19, Baden, Switzerland. Among the 130 deletions is "La Química Industrial Bayer-Meister-Lucius," Weskott y Cia., Mexico City.

Factories and business concerns are again asked to see that they keep their waste paper clean and entirely free from all other types of salvage. The paper mills report that an average of ten tons of foreign materials are being found in every hundred tons of waste paper they receive. As a result, thousands of tons of valuable salvage are being lost, principally rags, string, tins, rubber and paper. Damage to machinery with consequent hold-ups in production and injury to workers, not to mention a tremendous wastage of man-power and transport also result in many cases.

The scale of British leather research is inadequate for the needs of the trade, said Dr. Dorothy Jordan Lloyd, director of the British Leather Manufacturers' Research Association, at the first of a series of regional meetings in connection with research in the leather industry. She added that plans for the reconstruction of the Association were in view, and it was hoped that these would result in securing more interest from a large number of firms. The Association's president, Mr. Hubert Withinshaw, also spoke, explaining that without scientific development export trade might languish.

An excellent programme of lectures and demonstrations for the coming season has been prepared by the authorities of the Manchester Museum. The opening lecture will be given in the Chemistry Theatre at the University on October 30 by Professor D. M. S. Watson, whose subject will be "Food and Agriculture." All the other lectures will be given in the Natural History Theatre.

Beet-sugar research is being encouraged under a scheme whereby the British Sugar Corporation and the growers both pay a levy of ½d. on every ton of home-grown beet. To date, over £15,000 has been spent this year on research, £1450 being used for manurial trials at Rothamsted and £1200 going to insecticidal research and development. Details of the project are given in S.R. & O. No. 1413, 1943.

Moneys payable to persons or businesses in any area of China (excluding Manchuria) which is in the occupation of a hostile power is now excluded from the requirement of the Trading with the Enemy (Custodian) Order, 1939 (which made obligatory the payment to the Custodian of Enemy Property of moneys payable to any person who is an enemy), except where the Board of Trade may otherwise direct, in accordance with the Trading with the Enemy (Custodian) (China) Order, 1943 (S.R. & O. 1943, No. 1417).

Foreign News

The Peoria laboratory of the U.S. Department of Agriculture has assembled over 2400 varieties of living moulds, yeasts and bacteria, and this is believed to be the largest collection of industrial mycological material in the world.

A paint for waterproofing match heads has been developed by the U.S. Bureau of Standards. The matches are intended for use by the U.S. Army in tropical areas, and it is said that they ignite even after immersion in water for four hours.

New metallurgical processes used in the United States will be communicated to Brazilian scientists and industrialists in a series of lectures which leading American metallurgists are to give at the Escola Politechnia of the University of S. Paulo.

American producers of synthetic vitamins have reduced the price of riboflavin (vitamin B_2), following reductions for thiamine hydrochloride and ascorbic acid. The price for riboflavin in lots of 100 gm. or more is $490 per kg.

Critical concentration of ammonia in water so far as the corrosion of iron is concerned is one per cent., states an article in *Chem. Met. Eng.*, August, 1943, p. 111. Solutions of that concentration or greater will not corrode the metal, but there is increasing susceptibility to attack as the concentration falls below that strength.

The American Metal Congress will meet for the 25th time in Chicago during the week beginning October 18. The American Society of Metals, the American Welding Society, the Wire Association, and the Iron and Steel and Metals Divisions of the American Institute of Mining and Metallurgical Engineers are co-operating in the organisation of the conference.

Sweden's production of aluminium has been increased to about 4000 tons a year through the erection of new plants, stated Mr. V. Oskarsson, a director of Svenska Aluminium Kompaniet, recently. This quantity corresponds to about two-thirds of the country's requirements before the war. The metal is produced with andalusite and limestone as raw materials.

Hydrocyanic acid adsorbed on cellulosic discs is proving an effective insecticide for the disinfestation of U.S. Army barracks. As in the more customary method of fumigation, it is still necessary to seal the windows and doors of the buildings under treatment, and the fumigation crews have to work in gas masks with a special HCN container attached.

The U.S. Alien Property Custodian has announced that the General Electric Co. has assigned 37 patents covering cemented or sintered hard carbides used in making machine tools, and that these are now available for use by American industry on a non-exclusive royalty-free basis. General Electric originally acquired the patents from Krupp.

Synthetic resins for road marking are recommended by a German manufacturer who is using aqueous dispersions and emulsions of synthetic resins in mixtures with colouring agents, softeners, etc., for markings on the road surface. They can be made harder by subsequent treatment with an acid catalyst, such as hydrochloric acid, and are said to possess a high degree of wear-resistance.

Licences to import into India chemicals and paints in bulk, raw asbestos, wood pulp, mineral oils, rubber manufactures, and explosives, should now be applied for to the Chief Controller, Hutments Block No. 108, near North Block, Imperial Secretariat, New Delhi. For manufactured and semi-manufactured metals and ferro-alloys apply to the Steel Import Controller, 7 Wellesley Place, Calcutta.

Food yeast production from waste cane molasses of Cuba and Puerto Rico is being considered, states a note in *Chem. Met. Eng.*, August 1943. The product, resembling that manufactured by the process worked out by the D.S.I.R. in this country (CHEMICAL AGE, 1943, 48, p. 249), would be used to supplement protein feeding-stuffs for cattle. To the same end more complete recovery of the protein waste at alcohol plants is being planned by the United States.

Sulphaguanidine, the sulphonamide used for treating dysentery, is now being marketed in Palestine as a product of the factory of Abic, Ltd., of Tel Aviv. This factory hopes shortly to have sufficient stocks to serve the whole of the Middle East. Another sulphanilamide derivative, sold under the name of Pyranil, is being made by Teva Ltd., of Jerusalem, and this firm is also synthesising hexyl-resorcinol, a valuable vermifuge against parasitic threadworms.

Forthcoming Events

At a meeting of the **Institute of Fuel**, North-Eastern Section, to be held in the Central Station Hotel, Newcastle-on-Tyne, on **October 18,** at 5.30 p.m., Mr. J. G. Bennett, Director of the British Coal Utilisation Research Association, will give an address on "The Need for Industrial and Scientific Co-operation," which will be followed by a discussion.

The Royal Photographic Society will meet at 16 Princes Gate, London, S.W.7, on **October 19,** at 6 p.m., to hear papers by Dr. G. W. W. Stevens and Mr. P. C. Smethurst on "High Resolution Microphotography: Graticules."

The Agricultural Group of the **Society of Chemical Industry** meets in the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, on **October 19,** at 2.30 p.m., to hear a lecture by Mr. W. Morley Davies on "Lime in Agriculture."

The third set of fuel economy lectures arranged by the **Association of British Chemical Manufacturers** will be given in the Reynolds Hall, Manchester School of Technology, on **October 20,** at 3.30 p.m. The subjects—"Grinding" and "Dryers, Heat and Mechanical"—will be briefly introduced by Mr. J. C. Farrant (International Combustion, Ltd.) and Mr. F. R. Farmer (Kestner Evaporator and Engineering Co., Ltd.), and then followed by discussion. Non-members who wish to attend should notify Mr. W. Murray, of the Liverpool Borax Co., Ltd., Maxwell House, 6 St. Paul's Square, Liverpool, 3.

At a meeting of the **Chemical Society** at Burlington House, Piccadilly, W.1, on **October 21,** the following papers will be read: "Experiments on the Synthesis of Purine Nucleosides," by J. Baddiley, G. W. Kenner, B. Lythgoe, D. McNeil, A. R. Todd and A. Topham; "The Brönsted Relation in the Hydrolysis of the Halogenoacetates and the Theory of Acids and Bases," by G. F. Smith; and "The Course of Autoxidation Reactions in Polyisoprenes and Allied Compounds," by E. H. Farmer, H. P. Koch and D. A. Sutton.

The London section of the **Oil and Colour Chemists' Association** is holding a meeting at the Charing Cross Hotel, London, on **October 22,** at 6 p.m., to hear a lecture on "Management and the Chemist," by Mr. A. J. A. Kennedy, managing director of Ault & Wiborg, Ltd.

A conference on "Management in Action" will be held by the **Institute of Industrial Administration** from **October 22** to **24, 1943,** at the Waldorf Hotel, London. Sir Cecil Weir, Director General of Equipment and Stores, Ministry of Supply, and Viscount Davidson will address the conference, which will examine and discuss the responsibilities of executives charged with the functions of production, personnel, marketing, and Finance. Details can be obtained from the Institute's headquarters, Artillery House, Artillery Row, London, S.W.1.

At the meeting of the **Association for Scientific Photography** to be held at the Institution of Mechanical Engineers on **October 23,** at 2.30 p.m., papers on mechanical engineering and the use of photographically-sensitised metal, wood and plastics will be presented by A. Hessell Tiltman, B.Sc., F.R.Ae.S., and S. A. Woodward.

The London section of the **Electrodepositors' Technical Society** will meet at the Northampton Polytechnic, E.C.1, at 6 p.m., on **October 25,** to hear a paper by N. A. Tope on "Zinc Plating from Sodium Zincate Solutions."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

C. T. BROCK AND CO.'S CRYSTAL PALACE FIREWORKS' LTD., Hemel Hempstead. (M.S., 16/10/43.) Satisfaction September 21, of debenture registered April 8, 1943, to the extent of £5000.

MIDLAND TAR DISTILLERS, LTD., Birmingham. (M.S., 16/10/43.) Satisfaction September 25, of debenture stock registered August 6, 1936, to the extent of £8500.

Company News

Peerless Chemical Laboratories, Ltd., have increased their registered capital of £500 by the addition of £500 in £1 ordinary shares.

Erinoid, Ltd., have declared an ordinary dividend of 10 per cent. (same) for the year ended July 31. Net profit was £15,974 (£25,526).

The Shawinigan Water & Power Company announces a net revenue of $6,887,797 ($7,090,987) for the six months to June last, and a profit, subject to tax, of $3,531,559 ($3,772,874).

Evans, Sons, Lescher & Webb, Ltd., are paying a dividend of 3 per cent. for the year, as against nil last year.

The Paterson Engineering Co., Ltd., recorded a net profit of £10,785 (£10,351) for the year to April 30. The dividend, as already announced, was unchanged.

Chemical and Allied Stocks and Shares

THE undertone in Stock Exchange markets has been fairly steady, and in the absence of improvement in demand, movements in most classes of securities were small. There were, however, individual features of strength among industrial shares, and in the gilt-edged section, short-dated stocks were better on balance. Imperial Chemical at 38s. 7½d. were the same as a week ago, and the 7 per cent. preference units at 34s. 6d. were also unchanged on balance. Moreover, B. Laporte continued to change hands around 80s., and dealings in Fisons ordinary were again around 50s. Burt Boulton remained at 20s. Murex showed improvement to 102s. 6d. on further consideration of the results, and Imperial Smelting strengthened to 15s. 9d. compared with 15s. 3d. a week ago.

On the other hand, Borax Consolidated eased to 37s. 3d., and General Refractories to 17s. 10½d., but the rather lower prices were attributed to absence of improvement in demand; as in most other directions, very little selling was in evidence. Turner & Newall at 78s. 9d., British Oxygen at 80s., Dunlop Rubber at 39s. 3d., and British Match at 39s. 6d. were little changed on balance. Moreover, at the time of writing, Nairn & Greenwich have been maintained at 68s. 9d., Barry & Staines at 43s. 6d., and British Drug Houses again showed dealings around 24s. There was an easier tendency in United Molasses at 31s. 3d., but on the other hand, the units of the Distillers Co. at 90s. held most of their recent rise. The yield on the latter is small, but this is explained by the strong balance-sheet position and general realisation of the company's diversified interests, most of which would seem to have scope for further expansion after the war. A better tendency was maintained in Associated Cement, which were slightly higher at 66s., and British Plaster Board 5s. ordinary improved to 29s. 3d. Triplex Glass 10s. ordinary became reactionary on the cautious nature of the chairman's annual statement, and have declined on balance from 39s. to 38s. 3d. Moreover, Wall Paper deferred units moved back from 41s. 6d. to 41s. under the influence of the reduced profits for the past financial year; the shares are still on a very small yield basis, as, however, are many other industrial securities which are governed mainly by hopes of recovery in earnings and dividends after the war. Courtaulds is another instance where there is a small yield on last year's dividend, but improved dividends are hoped for after the war. Similar remarks apply to Turner & Newall, Boots Drug, and many other leading industrials. The 5s. ordinary shares of the last-named company at 42s. 9d. were 9d. lower than a week ago; the yield, based on last year's 24 per cent. dividend is 2¾ per cent.

Among iron, steel and kindred shares, Allied Ironfounders eased 6d. to 49s., but Babcock & Wilcox improved to 47s. 9d. At 31s., Dorman Long lost a small part of their recent rise, but Guest Keen were maintained at 35s., and the apparently generous yields tended to attract rather better demand for United Steel and a number of other shares in this section. Elsewhere, Staveley ordinary were higher at 53s. 6d., and Stewarts & Lloyds firm at 53s. 4½d., while Tube Investments were maintained at 92s. 9d. Richard Thomas 6s. 8d. ordinary were little changed at 10s. 9d.

In other directions, British Celanese were active and improved on balance to 33s., aided by the hope that the forthcoming results and annual statement would confirm market views as to the encouraging position and outlook. Elsewhere, however, there was a reactionary tendency in Bradford Dyers and Bleachers ordinary units, following their recent gains. In other securities W. J. Bush ordinary were again 55s.; business at close on £5¾ was recorded in the 5 per cent. £5 preference shares. Among plastics, Thomas De La Rue showed firmness at 170s. on the deal announced by the company's plastics subsidiary. British Industrial 2s. ordinary were active at the higher level of 7s. 4½d. Erinoid 5s. ordinary eased to 11s. 10½d., although it is assumed the full results will show that the reduced profits announced in the preliminary statement arise from the weight of taxation. Dealings up to 8s. 7½d. were recorded in British Glues 4s. ordinary, and at 12s. 6d. in Lawes Chemical. Leading oil shares showed a slightly reactionary trend.

British Chemical Prices

Market Reports

TRADE in general chemicals in London is reported to be steady and a fair weight of new business has been transacted, while contracts are being steadily drawn against by consumers. With regard to the price position there is no change of any importance to record, although the tendency throughout remains firm. In the soda products market such items as industrial refined nitrate of soda remain steady, with

quotations on a firm basis, while a good demand is reported for bicarbonate of soda, soda ash, and caustic soda; salt cake and Glauber salt are strong items. There is a fair pressure for supplies of hyposulphite of soda, which are well maintained so far as values are concerned. Short supplies and strong market conditions are the dominant features of the potash section, with the pharmaceutical and commercial grades of permanganate of potash finding a steady outlet at the old price levels. Interest is well maintained in both bichromate of potash and caustic potash, while a steady business continues to be reported in acid phosphate of potash. There is little to report from the coal-tar products market this week. Trade in pitch has been on a moderate scale and a fair movement of both crude and refined tar has been reported. All descriptions of the light distillates are in good request, especially the benzols and toluols, with no fresh movement in quotations to report.

MANCHESTER.—Generally satisfactory trading conditions have been reported in the Manchester chemical market during the past week. There is a fair volume of inquiry about and this is resulting in a moderate amount of new business in the leading heavy products. In a number of directions trade is restricted only by the quantities on offer and under these conditions quotations as a whole keep extremely firm. So far as movements of supplies against contracts are concerned, delivery specifications for the bread-and-butter lines are circulating steadily from the textile and allied trades, as well as from other users, and replacement bookings are being entered into as the need arises.

GLASGOW.—There is no actual change in the Scottish heavy chemical trade during the past week, home business remaining steady, while export business is still rather limited. Prices remain firm, with no actual changes to report.

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